Environment Canada Environnement Canada

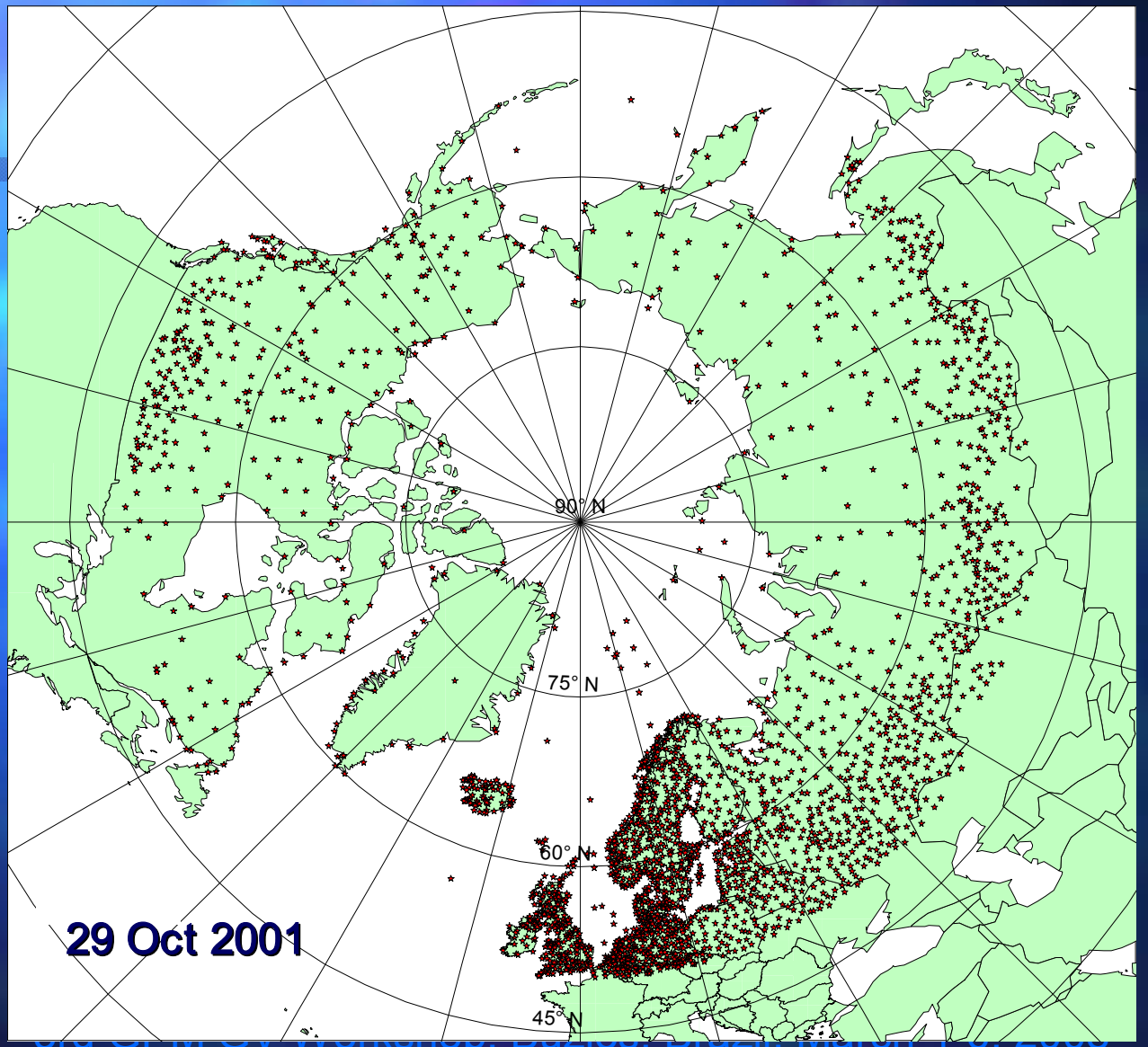
Canada

# GPM GV Activities in Canada

David Hudak and Paul Joe
Environment Canada

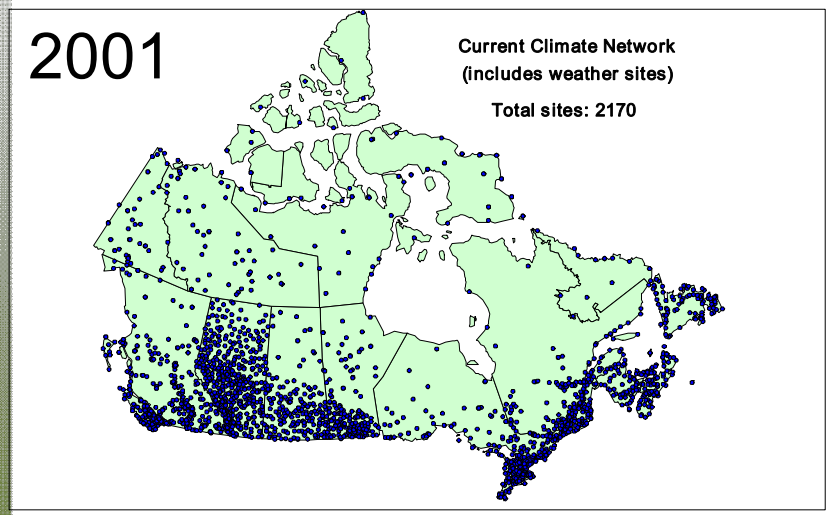
3rd GPM GV Workshop, Buzios, Brazil, March 4-6, 2008

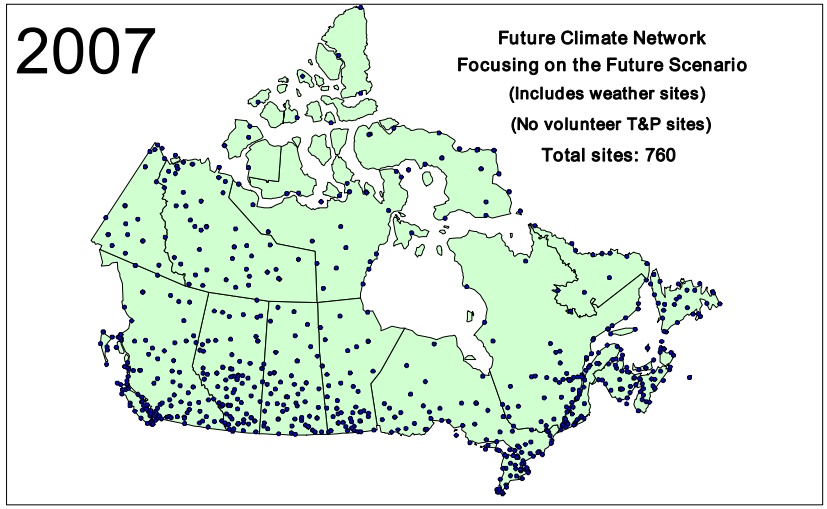
# All active Synoptic Stations north of 50 N




Ref: WMO Publication No. 9 Volume A

# Changes to EC Climate Network



# WG3 Closing the Gap between Algorithm Development And GV Science

- Overall Goal: Finding the most important shortcomings of the algorithms. We strongly suspect this involves microphysics in general (e.g. microphysics parameterization within CRM, PSD in solid and mixed phase regions, …).

# Tentative Recommendations

- GV is an inappropriate name! What's needed to validate the atmospheric volumes over the lifetime of the precip. Systems.
- Starting now with existing databases.
- More effective communication between algorithm developers and observational scientists:
  - Open source and documentation
  - Address the needs of algorithm developers for data and metadata
- Snow, light precipitation, and complex terrain create special difficulties that need early attention.
- Consider an international science workshop to facilitate effective international cooperation.

# I. Overview

- EC Radar and Weather Observing Network to understand and resolve first order variability and bias.
- Physical Studies of Winter Precipitation in the Great Lakes area, the High Arctic, and in Mountainous Terrain
  - Undertake measurements of cold season weather systems directly related to physical formulations and physics assumptions embedded in algorithm designs
  - Carry out physical studies aimed at improved understanding of underlying dynamical, thermodynamical, hydrological, macrophysical, and microphysical properties of precipitating storms throughout their life cycles

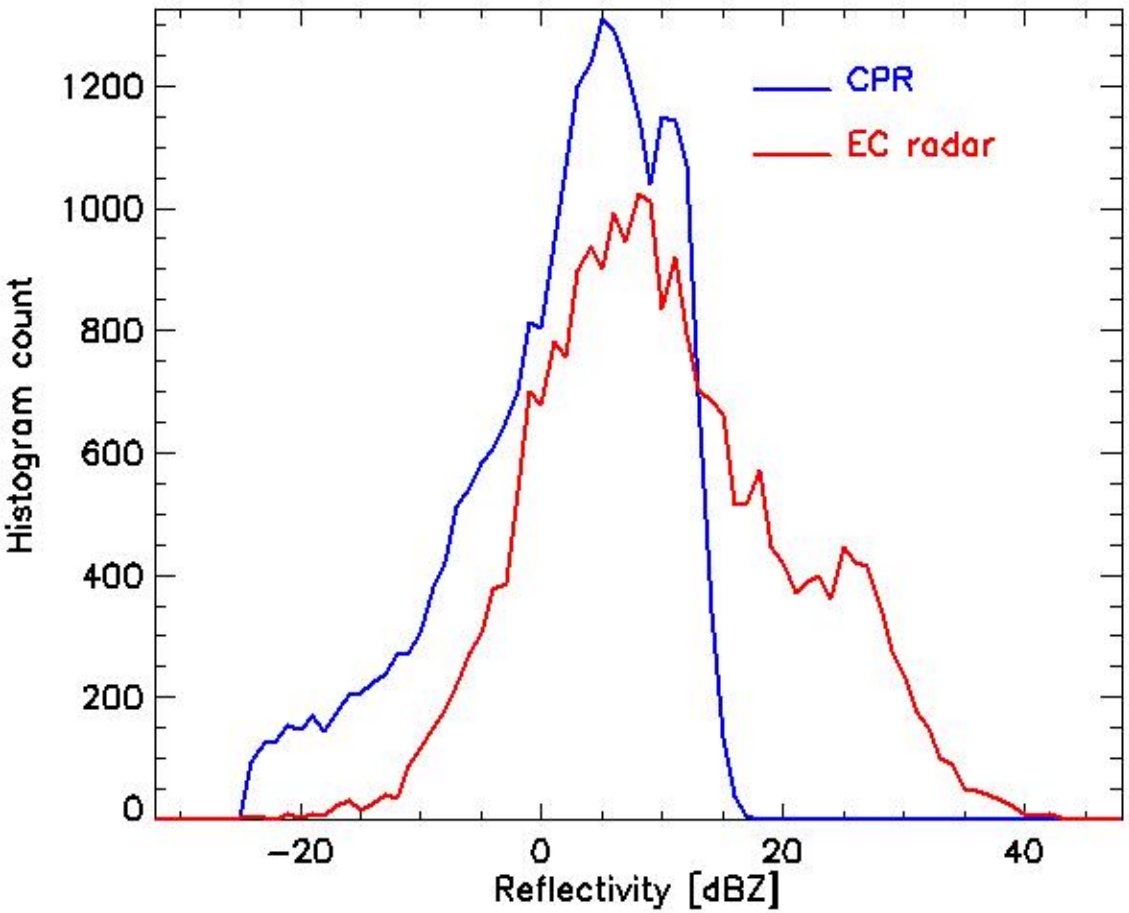
# EC National Network

# EC National Network Validation

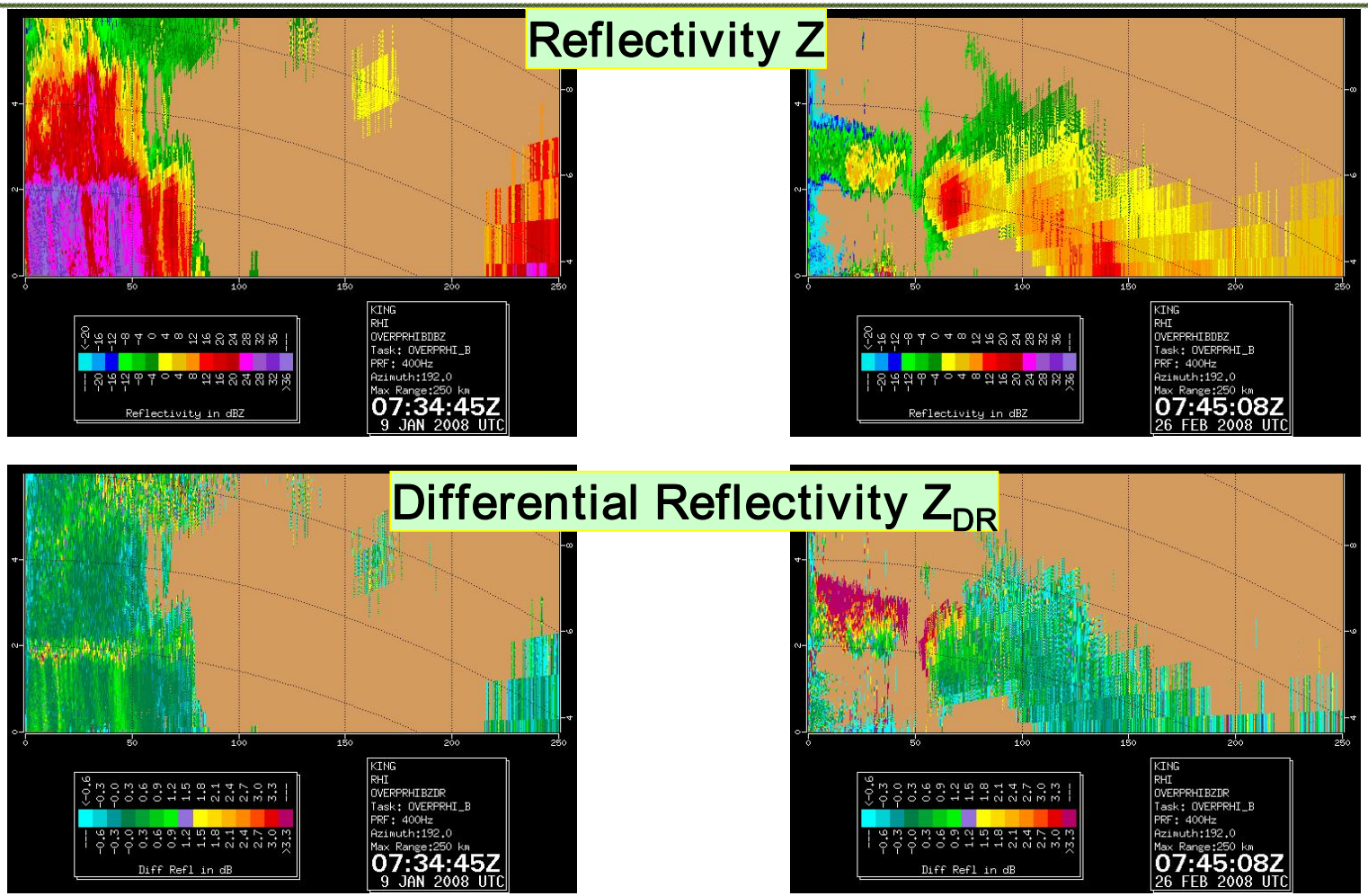
- Independent estimates of precipitation to
  - Develop statistics on different climate regimes in Canada
  - Understand error metrics
  - Assess scale variability
  - Examine sensitivity
- Use the precipitation information contained in the CloudSat observations as a data base for developing and testing precipitation algorithms required for GPM.
- Evaluate the CloudSat precipitation algorithms (occurrence, type and rate) for
  - Detection threshold
  - Ground clutter
  - Attenuation

# CloudSat W-band CPR vs EC King City C-band Radar

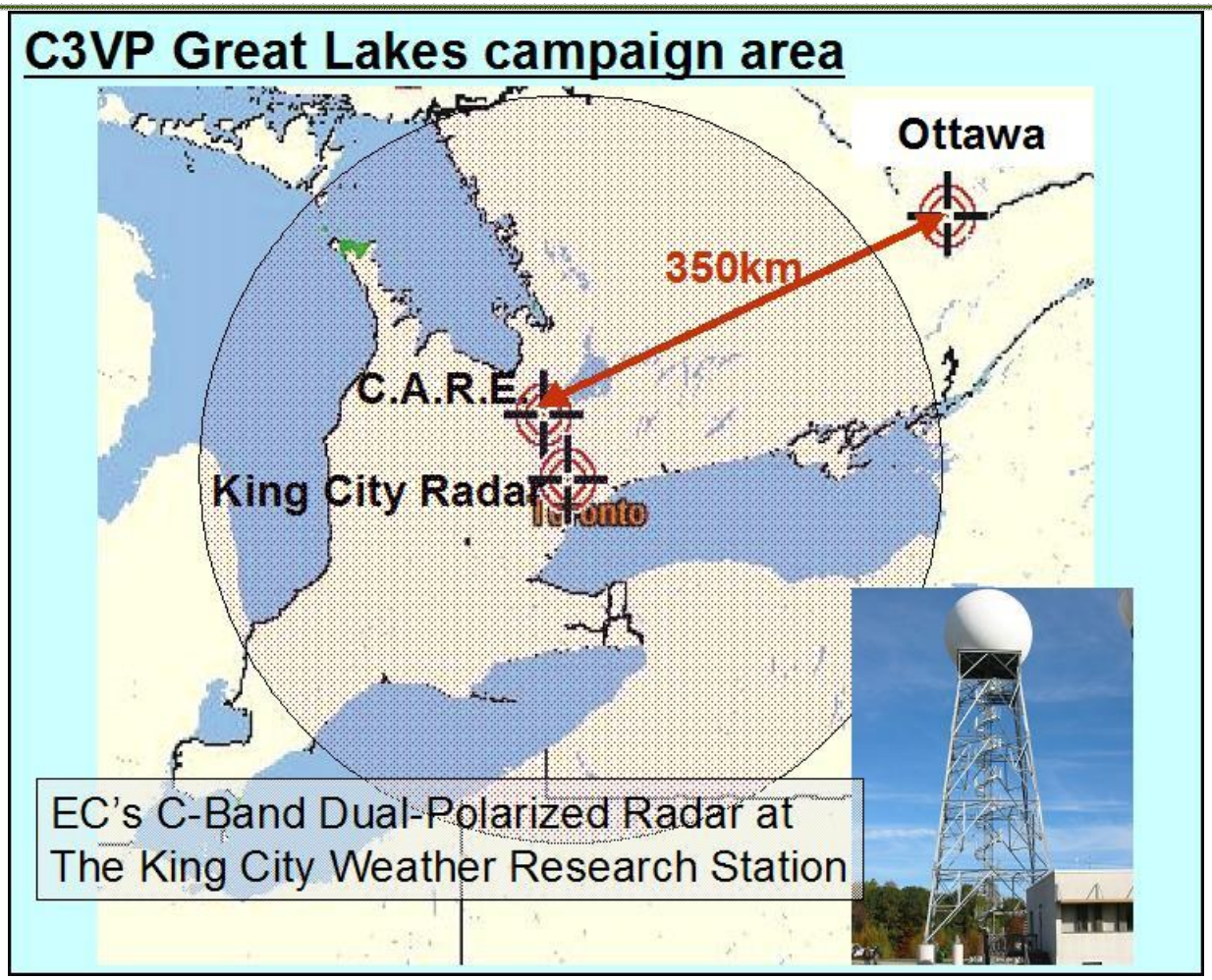
Reflectivity distribution from 1456 profiles of precipitation from Sept. 2006 to April, 2007



# RHIs from EC King City Radar along CloudSat track



# PV1: Canadian CloudSat and CALIPSO Validation Experiment (C3VP)

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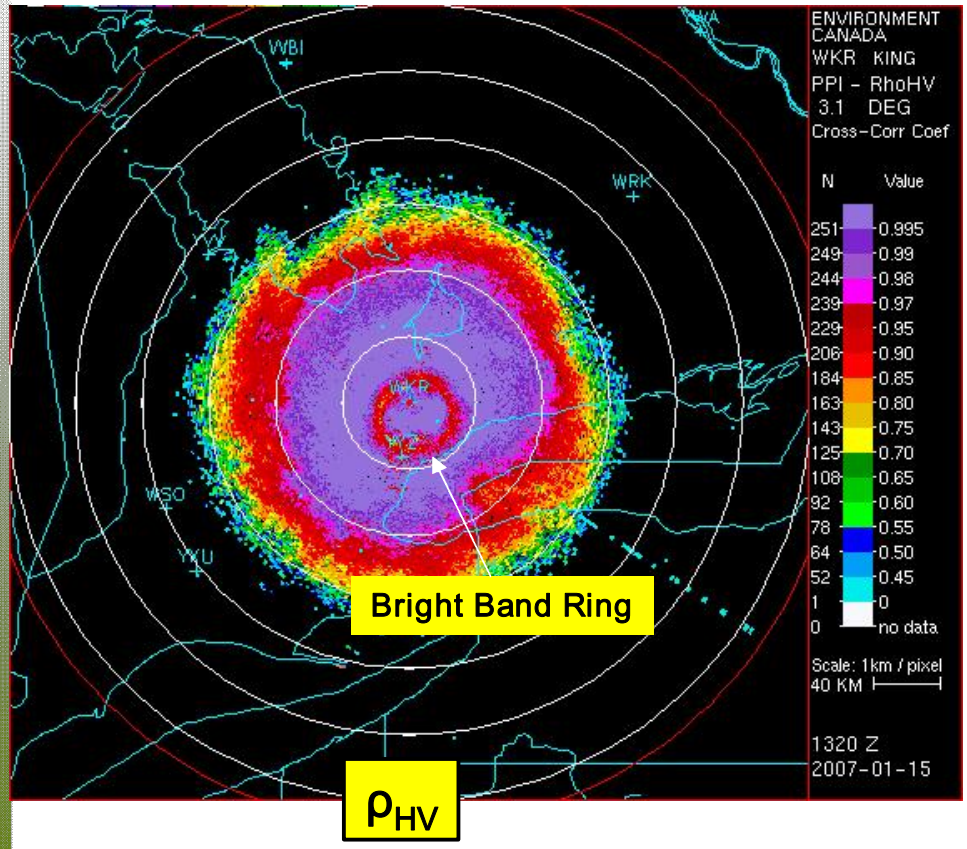
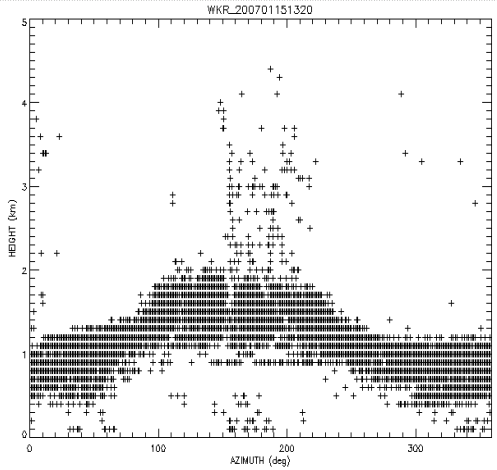
# C3VP (cont'd)

## Winter applications of the EC Interactive Particle Identification Algorithm

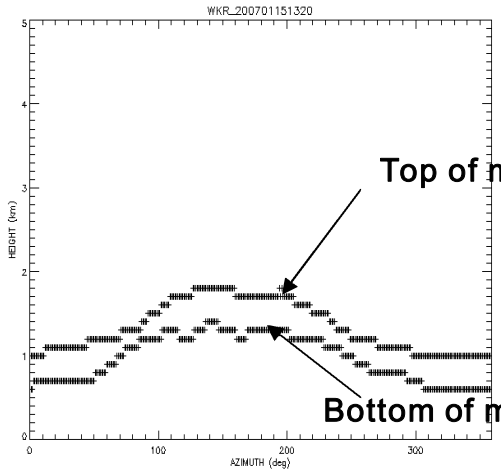
- To develop an automated winter precipitation type identification package using C-band dual polarization radar data the main input.
- The in-situ data collected at CARE and more generally by the EC weather observing network will be critical in validating these algorithms.
- This development will lead to an advanced verification tool for GPM products and as support for other GPM Z-S related studies.

# 0°C Detection

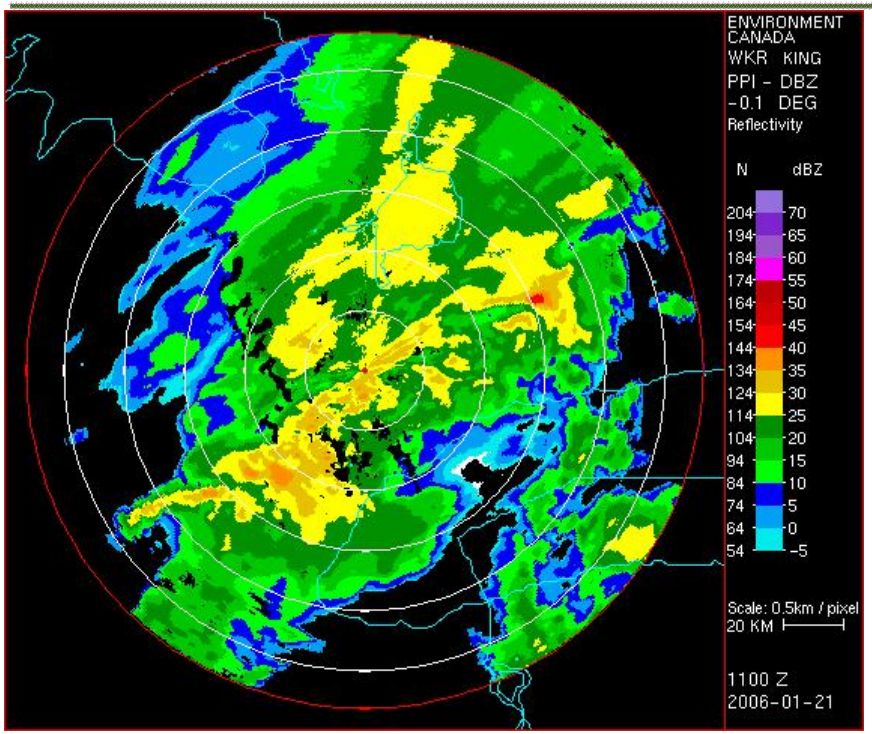


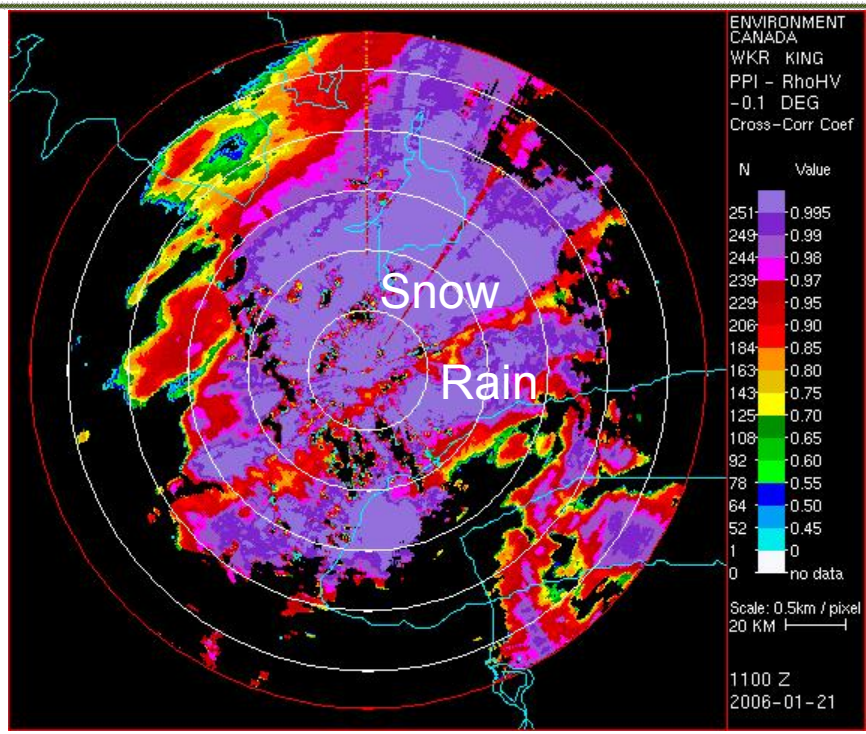

Fuzzy logic pixels identified as wet snow



# Rain/Snow Line

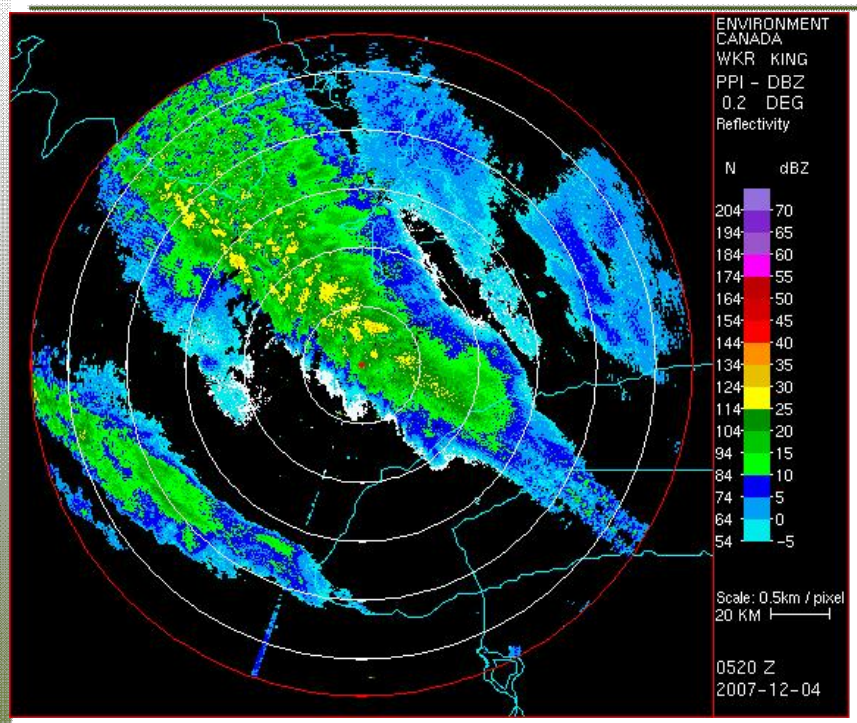



Reflectivity Z

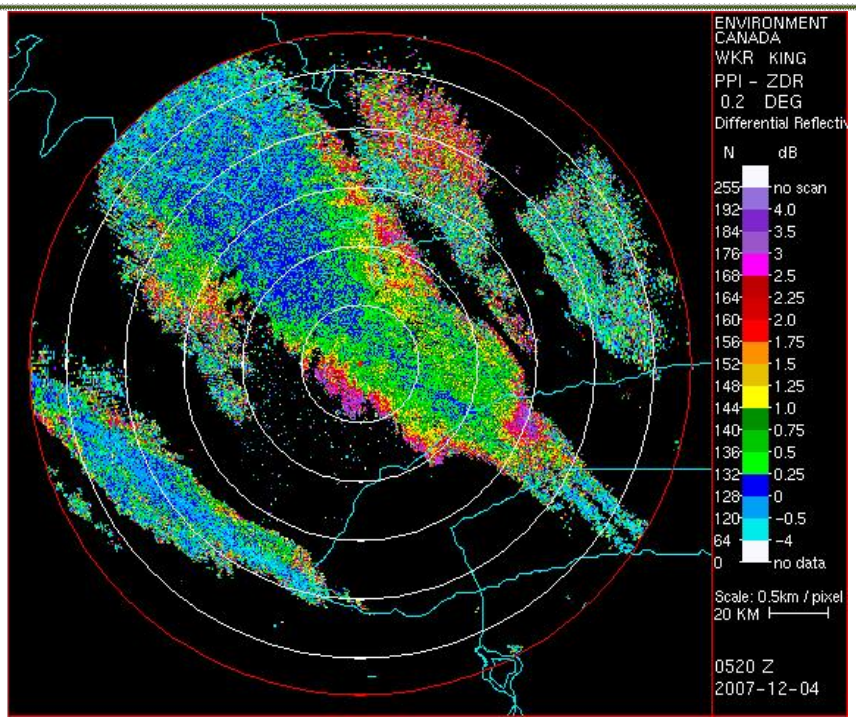



Correlation Coefficient $\rho_{HV}$

# Nature of Snow




Reflectivity Z

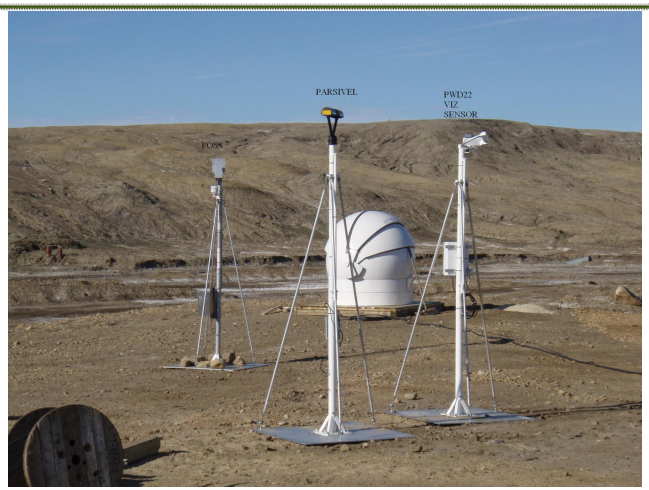



Differential Reflectivity $Z_{DR}$

# PV2: Polar Environment Atmospheric Research Laboratory (PEARL)

To provide a quantitative description of high latitude precipitation characteristics

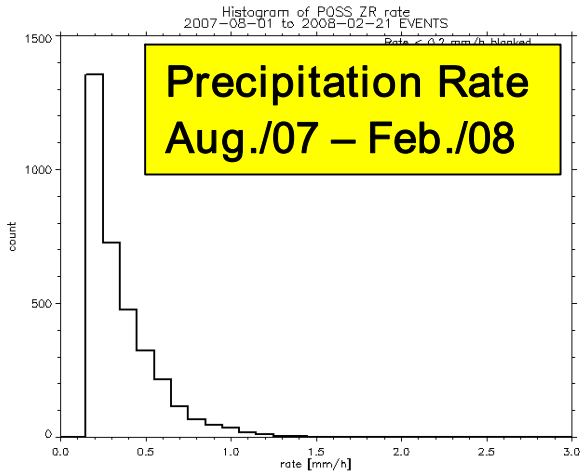
# PEARL (cont'd)

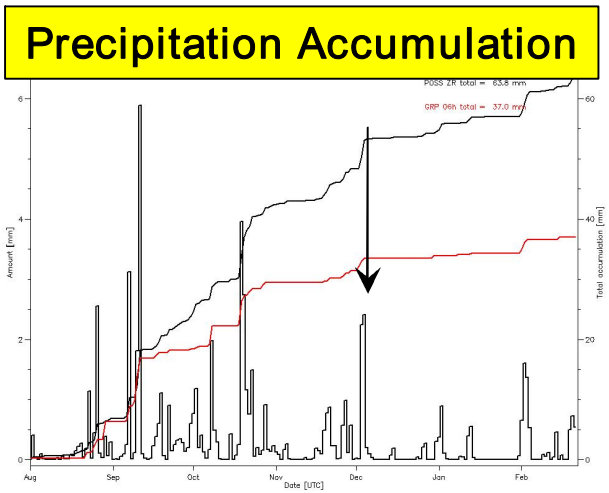


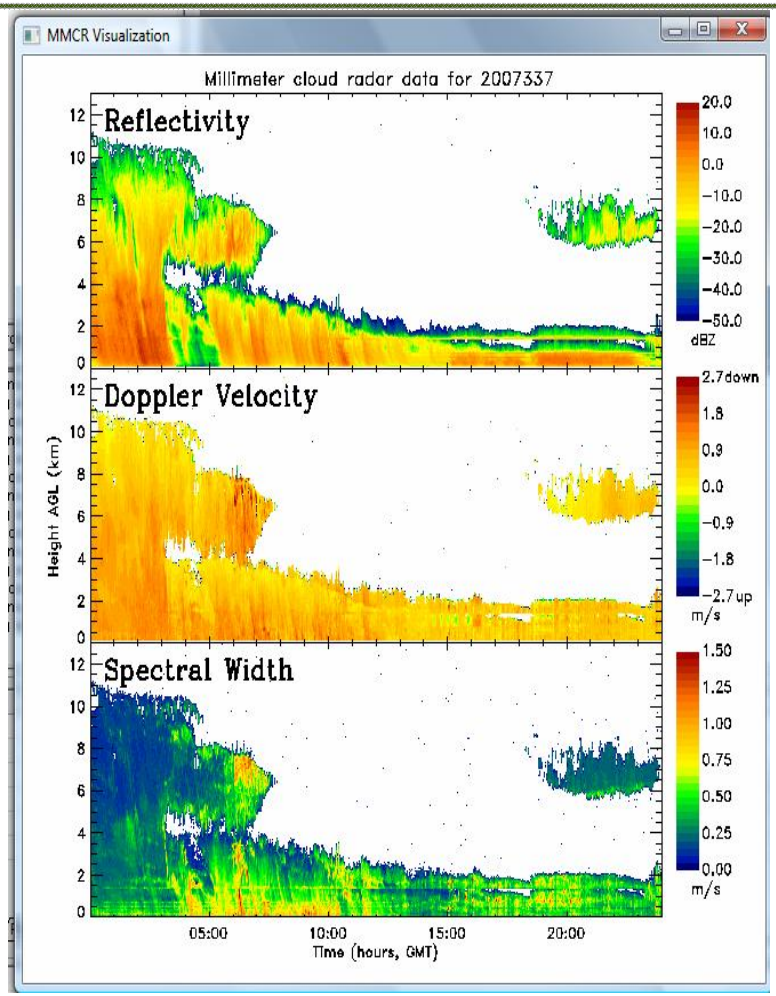

- Analysis of precipitation rate and type from the sensors at Eureka.

- Description of precipitating weather systems in high latitudes using A-train data and data from the MMCR at Eureka. High resolution runs of the Canadian GEM model in the Arctic will also support the analysis.

# PEARL (cont'd)

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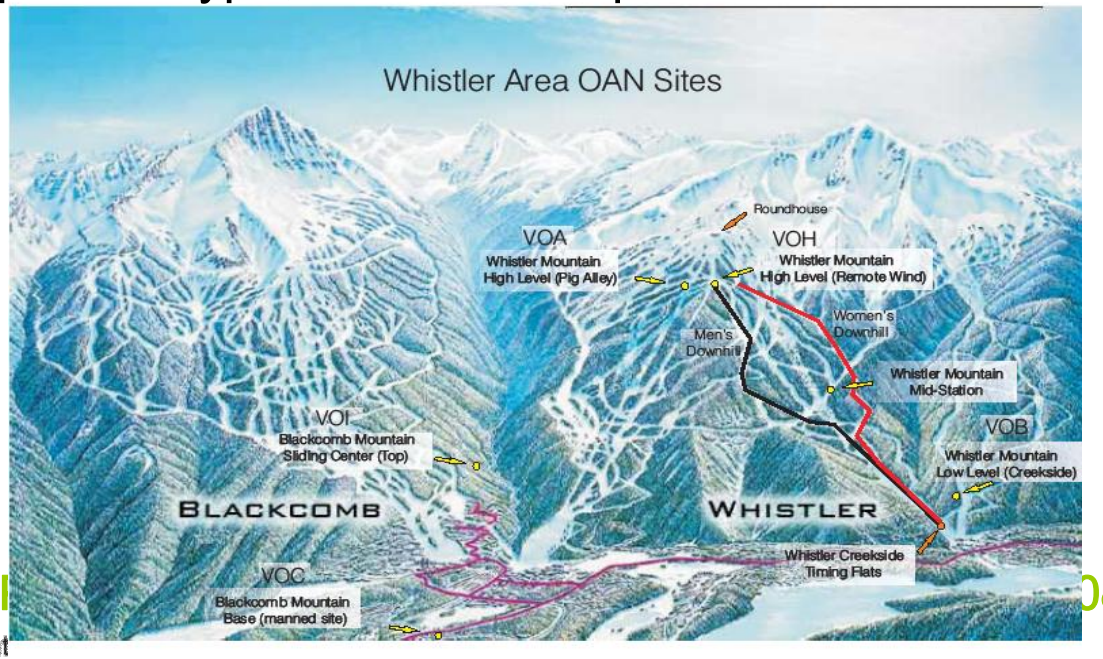
# PV3: Vancouver 2010 Olympics (V10)

Complex Terrain Precipitation Studies (Vancouver 2010 Winter Olympic Games)

- conduct particle density studies and precipitation retrieval studies from remote sensors
- One-dimensional micro-physical model of precipitation growth that includes particle type, size and shape .



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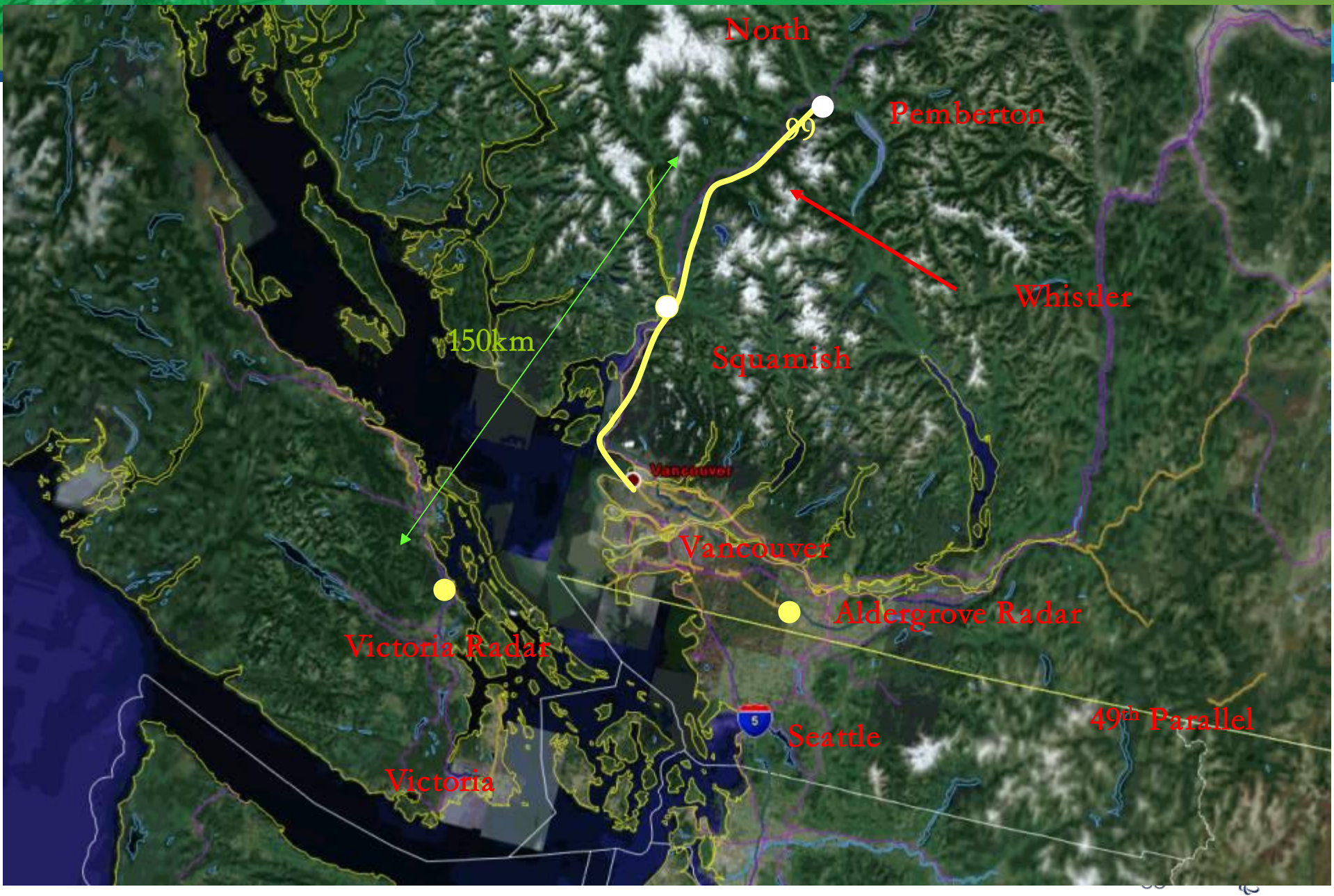
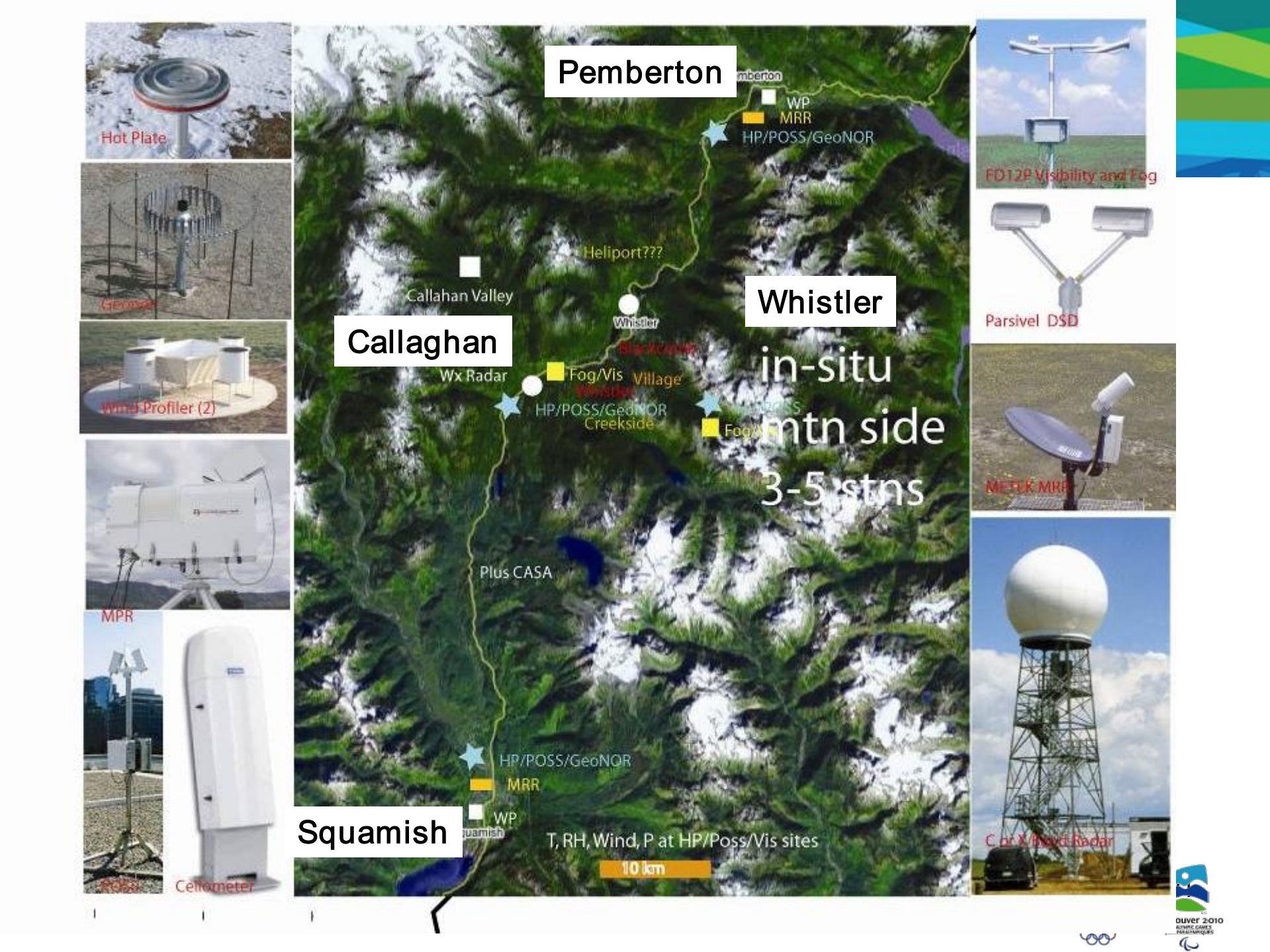
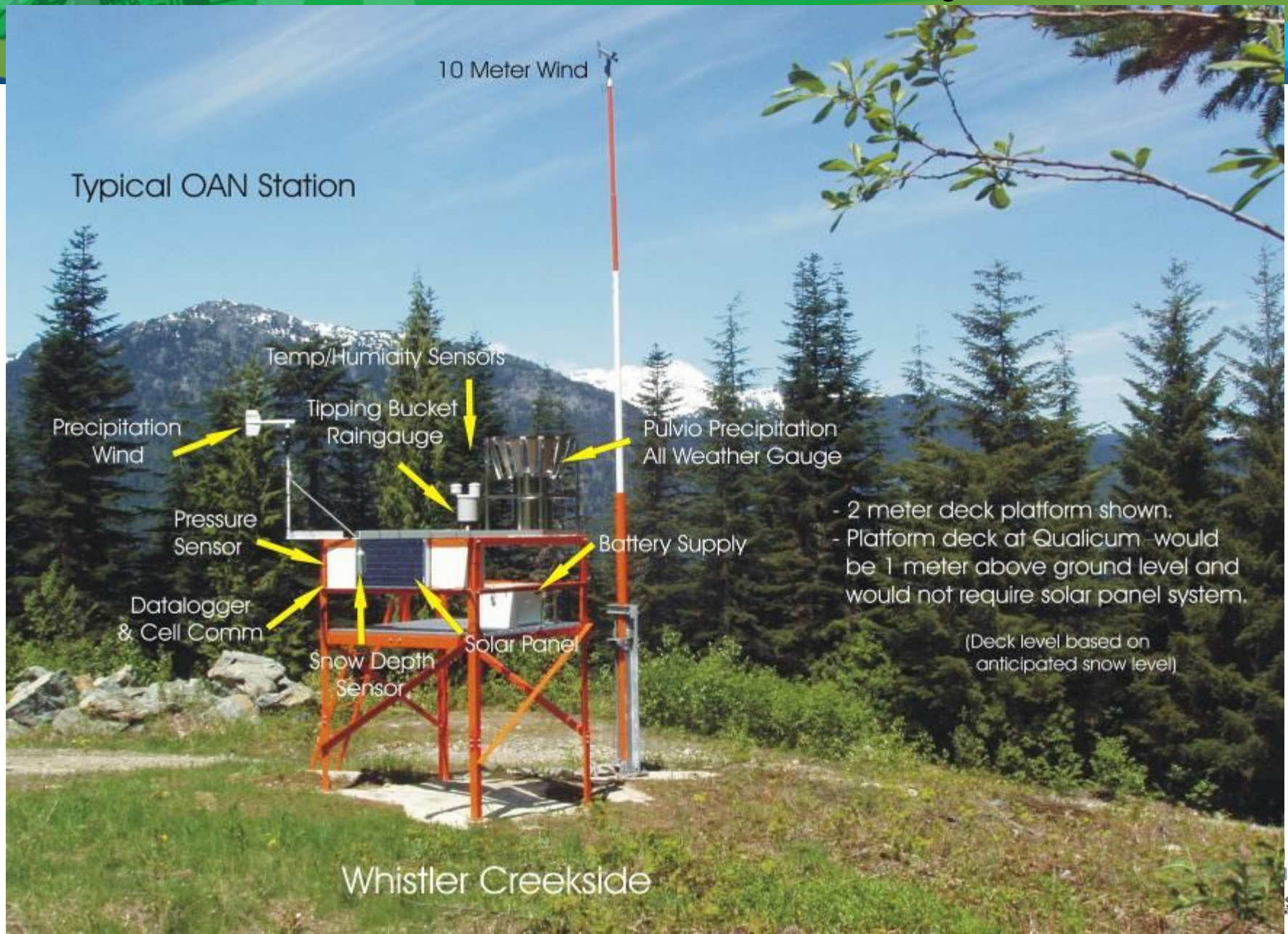
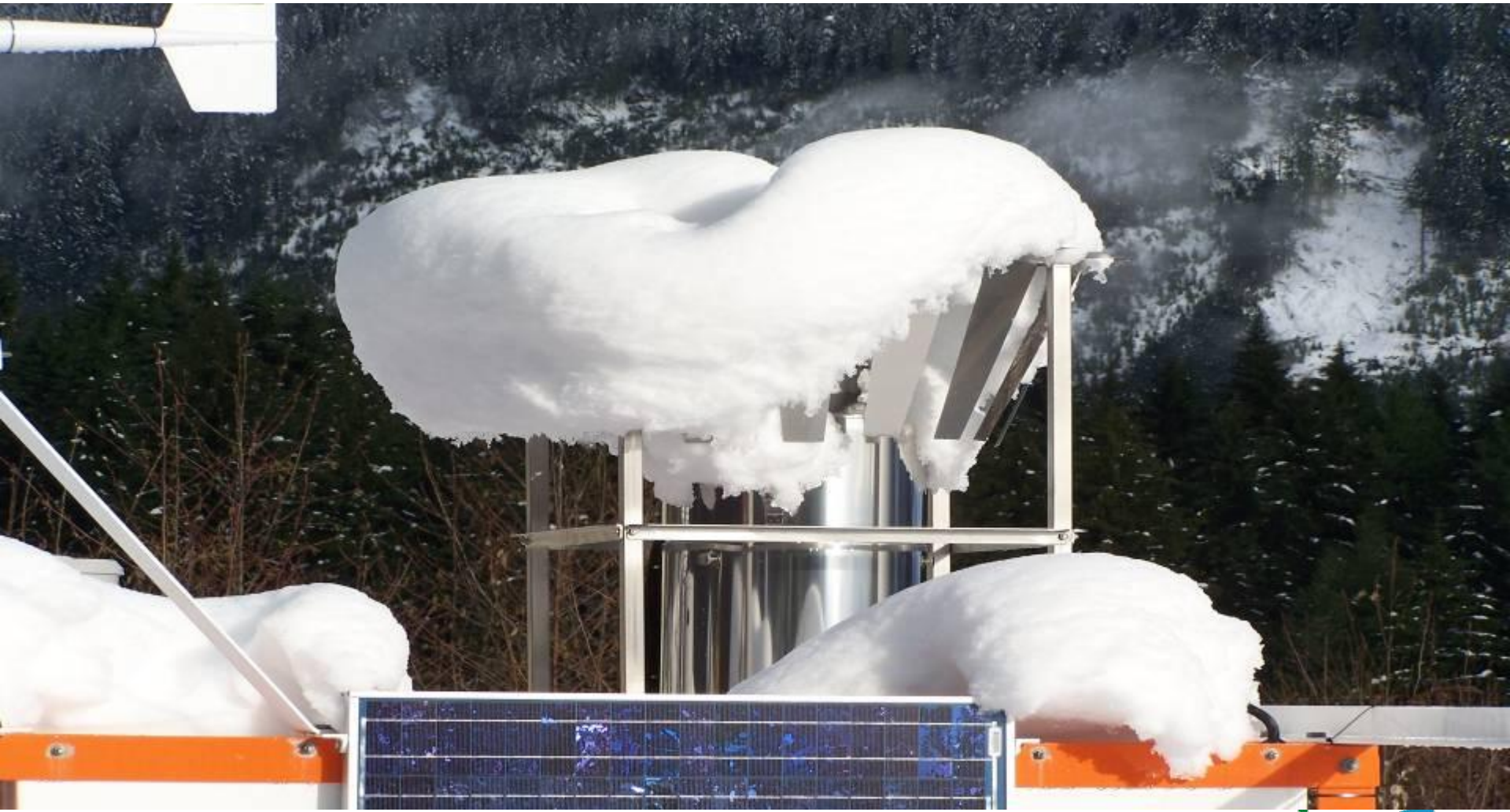

North
Pemberton
99
Whistler
150km
Squamish
Vancouver
Vancouver
Aldergrove Radar
Victoria Radar
5
Seattle
49th Parallel
Victoria


Hot Plate
Geonor
Wind Profiler (2)
MPR
Ceilometer
Pemberton
WP
MRR
HP/POSS/GeoNOR
Heliport???
Callahan Valley
Whistler
Callaghan
Whistler
in-situ
mtn side
3-5 stns
Wx Radar
Fog/Vis
Village
HP/POSS/GeoNOR
Creekside
Plus CASA
HP/POSS/GeoNOR
MRR
WP
Squamish
T, RH, Wind, P at HP/Poss/Vis sites
10 km
FD12P Visibility and Fog
Parsivel DSD
METEK MRR
C or X Band Radar

# Surface observations: systems



# Challenges of Heavy Moist Snow



# Synergies with others in the GV community

| Project | Collaborator | Institution |
|---|---|---|
| Network Validation | Matt Schwaller | NASA |
| C3VP | Isztar Zawadzki | McGill U. |
| | Bringi | CSU |
| | Walt Petersen | NASA |
| | Gail Skofronick Jackson | NASA |
| | Ali Tokay | NASA |
| | Chandrasekar | CSU |
| | Rob Cifelli | CSU |
| PEARL | Pavlos Kollias | McGill U. |
| | Jim Drummond | Dalhousie U. |
| | Ali Tokay | NASA |
| | Taneil Uttal | NOAA |
| V10 | Walt Petersen | NASA |
| | Gyu Won Lee | NCAR |
| | Ali Tokay | NASA |

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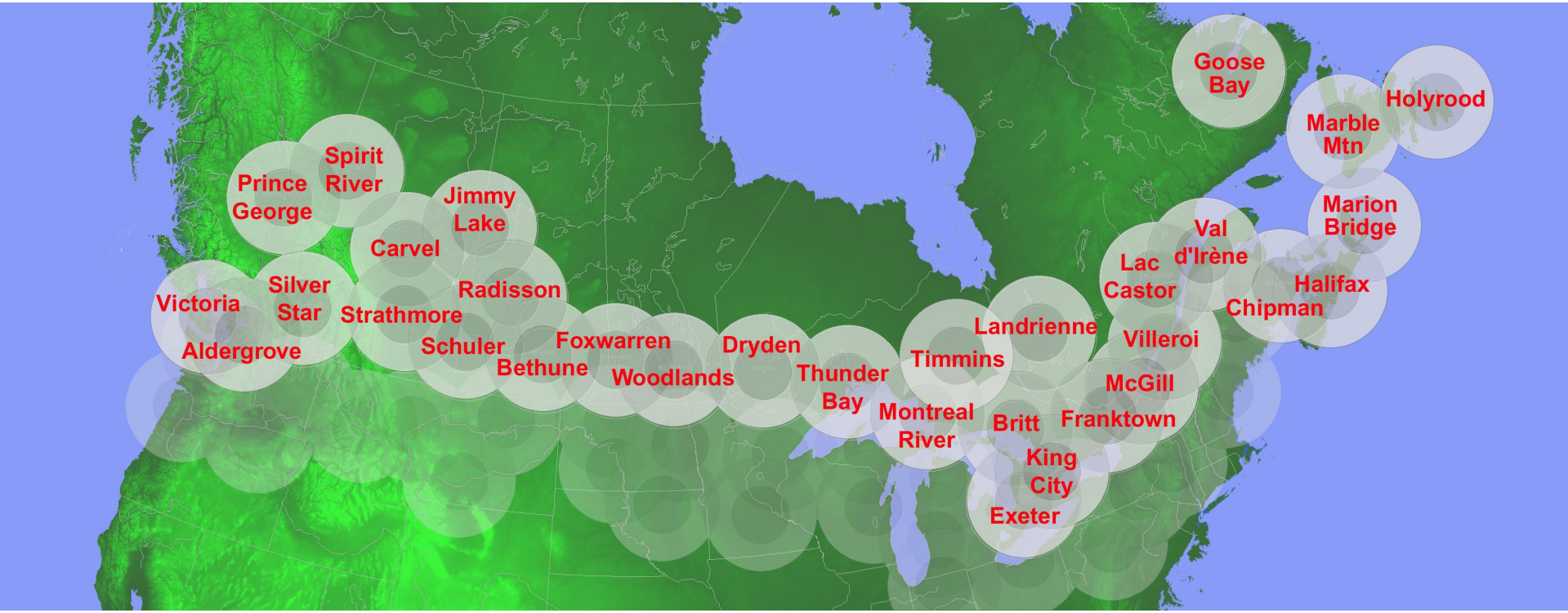
# Summary and Recommendations for Collaboration

- Enhance Integrated Validation collaboration
  - NWP
  - Hydrological modelling
- Coordination with researchers in Finland
- Integrate EC radar network observations with NEXRAD

# National Radar Network

(limited to the Southern border)



# THANK YOU/OBRIGADO

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